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ABSTRACT

The objective of the study was to develop a test of concept formation which would: (1) not be biased by reading difficulty; (2) be sufficiently stimulating to capture the attention of the students; (3) incorporate both aspects of concept formation of discriminative response and conservation; (4) have a spread of item difficulty appropriate for students in grades 2, 4, and 6; and (5) follow a group administration format. The final form of the test consisted of 34 items, 21 on conservation and 13 discriminative response items. The conservation items were presented via an 8mm film with accompanying sound. The 13 items were presented in a booklet, with one item per page. The types of conservation included in the test were number, length, discontinuous quantity, continuous quantity, mass, area, weight, and volume. Results of administering the test show group film testing to be a valid and reliable method of testing concept formation. (DB)

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Belmont Symposium - Concept Formation

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Elkind (1969) and Klausmeir (1971) have identified two distinct but complementary aspects of concept formation. The first of these is classical discriminative response concept formation. The research in this area, usually with adults, has taken many forms, from attribute cards to wooden blocks. In classical concept formation studies, the subject focuses attention on between-thing constancy. Positive and negative instances are presented and the subject is asked to identify an instance as positive or negative.

In the second view of concept formation, Piaget has the subject focus attention on a situation where a transformation is employed, namely a conservation problem. The S's task is to determine whether a named attribute of the figure, such as amount of water, has changed as a result of the transformation. Thus conservation is viewed as one type of concept formation task. The subject must attend to the constancy in the situation and ignore extraneous factors. Thus, concept formation is more than just learning the property shared by a set of stimuli, it also involves recognizing a constancy in the face of change in the stimulus objects. It is a matter of within-thing as well as between-thing constancy. The development of the concept formation test was guided by the literature on both classical concept formation and conservation studies.

The objective of the study was to develop a test of concept formation which would: (1) not be biased by reading difficulty; (2) be sufficiently stimulating to capture the attention of the students; (3) incorporate both aspects of concept formation delineated above; (4) have a spread of item difficulty appropriate for students in grades 2, 4, and 6; (5) follow a group

TM 001 429

administration format. The final form of the test consisted of 34 items, 21 on conservation and 13 discriminative response items. The conservation items were presented via an 8mm film with accompanying sound. This mode was chosen because a transformation could be presented to a group in a standardized format. The following table shows the number of items for each type of conservation.

Number Of Items For Each Type Of Conservation

number	4
length	3
discontinuous quantity	3
continuous quantity	2
mass	2
area	3
weight	1
volume	3

Here are a few items from part one of the conservation test. I will read the script rather than play the accompanying sound.

---------- Show three items number, quantity, volume ----------

To avoid having the answer always be ''same'' several items dealt with conservation of inequality. For example, one item showed two containers of beads with more in one of two congruent containers. The contents of the container with less was then poured into a taller thinner container. More items of this nature are being included in a revised form of the test. Subjects marked their response in an answer booklet showing a picture of a star, flower and a key. Items were constructed to assess conservation of number, length, quantity, mass, area, weight and volume.

The classical concept formation section (part II) of the test consisted of 13 items following two practice items. The items for this part of the test were presented in a booklet with one item per page. Two practice items were presented with 8mm film and test booklet. The items consisted of three rows of drawings of shapes with one, two or three attributes. The top row showed for exemplars, the second row showed four nonexemplars and the bottom row showed five alternatives. The subjects were instructed to mark their choice among the five alternatives in their answer booklets. Here is one of the practice items illustrating the nature of the items. ------ Show item ----- The accompanying sound would be: All of those on the top row are alike in some way. Those in the middle row are <u>not</u> like those in the top row. Mark the one in the bottom row which is like those in the top row.

The development of the test extended over a period of three years with four preliminary versions. In one study, (Wheatley, 1970) the conservation section of the group test was administered to first grade children along with an individually administered manipulative test. The scores on the two tests correlated highly (.86) thus indicating the validity of the group film testing. The KR-20 reliability of the test was .90.

In determining the differential effects of grade level, race and SES on concept formation ability, a 3 x 3 x 2 factorial design was used. Significant main effects ($p < .01$) on all factors were found with no significant interactions. There was excellent separation by grade level with a greater difference (7 points) between grades two and four than between grades four and six (3 points). Using Newman-keuls comparisons it was found that Whites performed significantly better than Blacks or Latins (2 points). It should be noted that the examiners were white and the recorded voice was that of a White female.

The disadvantaged group scored significantly lower than the advantaged group. However, the actual point difference was slight, 1.7 points of 34 on the total test.

Analysis of the correlation matrix for the three grades on concept formation with the general achievement variables and IQ showed small correlations ranging from .08 to .36 with two-thirds of the coefficients falling in the range from .15 to .28. Thus it appears that this test taps a factor or factors independent of achievement and IQ.

The existence of a valid and reliable test of concept formation has important implications for theoretical research as well as evaluation in the schools. Research data on concept formation can be gathered in an efficient manner with group testing. The use of the test is probably more significant for the classroom. Programs can be evaluated and classes can be screened for children at extremes needing special attention.

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Sample item from part II